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Chuck Shulock, Program Manager for Greenhouse Gas Reduction
Air Resources Board
1001 "I" Street
P.O. Box 2815

copy to:
Market Advisory Committee
Lisa Macumber, Office of Legislative Affairs, ARB
Assemblymember Ira Ruskin

Re: AB 32, AB 493

Dear Mr. Shulock:

I recently submitted several questions to the Market Advisory Committee relating to AB 32 implementation. Due to the Committee's compressed schedule and focused scope of work they may not be able to respond, but in their Feb. 27 public meeting they did respond to one question relating to cap and trade and AB 32's maximum feasibility mandate. Following is a statement of my questions, the Committee's response to the one question, and an informal policy brief discussing the broader implications of this question in the context of vehicle emission standards, feebates, and AB 493. The following discussion also touches on a couple of points that came up in a conversation that I had with Lisa Macumber on March 28 about AB 493 (specifically, whether manufacturers would absorb feebates into vehicle prices, and whether ARB would have legislative authority under AB 32 to institute a vehicle feebate program); and it addresses a question you raised about whether feebates would be expected to yield any greater emission reductions than AB 1493.

Questions for MAC and ARB:

> (1) The primary objective of cap and trade is to achieve an emission cap at minimum cost. Can market incentives be employed conversely to minimize emissions within the limitation of a cost-effectiveness constraint, and which approach - maximal cost reduction or maximal emissions reduction - is mandated by AB 32?
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> (2) (This question relates to Nancy Sutley's discussion of Southern California's RECLAIM program.) How are stationary-source NOx emissions regulated in Sweden; how has the Swedish program performed in comparison to RECLAIM, and does it represent a viable regulatory model for the U.S. power utility sector?

> (3) (This question relates to Brian McLean's discussion of the U. S. SO2 program.) Regarding the SO2 program, the costs and benefits were stated as $8 billion and $350 billion, respectively. Considering the cost/benefit ratio, does the SO2 program achieve maximum technologically feasible and cost-effective reductions in SO2 emissions?

MAC response to question #3 (excerpted from Feb. 27 meeting)[1]

> Brian McLean: I'm not sure. Our goal was to reduce SO2 by a certain amount and that's what we're doing. I'm not sure I understand the question. If you could read it again ...
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> Eileen Tutt: It says the costs and benefits were 8 and 350 billion, respectively. Considering the cost-benefit ratio, does the SO2 program achieve maximum technologically feasible and cost-effective reductions in SO2 emissions?
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> Larry Goulder: It seems to be an argument for a tighter cap.
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> Brian McLean: So the marginal costs equal the marginal benefits, as Dallas was saying. They're the maximum feasible, politically feasible and economically feasible reductions. You know, we can always do better. But I haven't, you know, we're doing pretty well and people have talked about whether we can go a little further and I'm sure you could make an argument that one could go a little further in a purely economic way, but in the reality of the world we deal with I think 85% reduction - we're pretty close. Maybe 90 is possible.
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> Judi Greenwald: Can I add something on that? I think this illustrates one of the sort of dynamic effects of these programs. When this program was first set up, which was in 1990, there was much higher, there were much higher estimates of what the cost was going to be, and then it turned out, through the market-based approach, there were a lot of incentives for people to reduce more for less money. And that in fact created the result that we have where we were seeing that we were actually getting reductions at a lower cost. And I think that helped to build support for the next phases which have occurred, for example, through or are occurring now through the CAIR rule. So I think one of the positive, important positive impacts of a program like this is that you actually incentivize folks to reduce their emissions and to minimize their costs. And then when you see that the costs, if it turns out that the costs are indeed lower than you thought then you can actually do more.

My comments:

The SO2 program is not based on a maximum feasibility mandate; but the broader question is whether cap and trade, applied to GHG emissions, can be expected to accomplish AB 32's statutory requirement. More fundamentally, is the economic efficiency of cap and trade (in terms of cost-benefit balancing) sufficient to the task of climate stabilization? The question applies generally to quantity-constrained policy instruments such as tradable performance standards. I will discuss the issue in this context, but my main points apply equally well to cap and trade, and the comparison to feebates applies more generally to refunded-tax-type policies.

[1] Webcast archive is accessible at http://www.climatechange.ca.gov/events/index.html. The above excerpt is at 03:09:50.

A tradable performance standard, such as that enacted by AB 1493, is essentially a cap-and-trade system that caps emission intensity. An alternative would be a price instrument such as the vehicle feebate proposed in AB 493 (introduced in the Assembly this year by Ruskin).

Feebate-type instruments have a close connection to emission trading, which is not generally appreciated. For example, a feebate could be structured to operate almost identically to AB 1493 by implementing it as a refunded tax, wherein a carbon tax is applied to new vehicles based on their CO2 gm/mi rating, and the tax revenue is refunded in proportion to some measure of the economic value obtained in connection with emissions (aka "output-based" refunding). The "feebate" is the tax-refund balance, a fee if positive and a rebate if negative. To replicate the performance of AB 1493, the refund would be allocated in the same proportions that emission allowances are allocated under the standard. The fully phased-in (2016) GHG emission standard under AB 1493 is 205 gm/mi for PC/LDT1 and 332 gm/mi for LDT2. Similarly, the corresponding feebate system would allocate LDT2 vehicles refunds 62% higher than PC/LDT1, reflecting their greater transportation utility. (LDT2 vehicles' higher refunds would be balanced by their higher taxes, so the refund disparity does not imply a net revenue transfer from LDT2 to PC/LDT1.)

If the feebate achieves an aggregate emission level identical to what would be required under the standard, then the zero-feebate emission level for all vehicles would match the AB 1493 standard; thus a vehicle's feebate would be zero under the same conditions that its emission trading gains or losses would be zero. The emission level would be determined by the market response to the feebate incentive, and the emission price (i.e. emission tax rate) that would achieve emission equivalence with the standard would match the market-determined price under the trading system. With this price matching, a regulated firm's gains or losses from feebates or trading, and its marginal incentives, will be the same in either case, and aggregate emissions under the feebate program will tend to equilibrate to the level defined by the standard.

A tradable standard could similarly be constructed to match the performance of a feebate system. For example, feebates could be applied separately to the PC/LDT1 and LDT2 classes, with refunds allocated at a uniform per-vehicle rate within each class and with revenue-neutrality maintained within each class. The emission standard corresponding to this feebate would be similar to the AB 1493 regulations, but without trading between the two classes.

The feebate calculation procedure prescribed by AB 493, Sec. 43304(b), would be similar to AB 1493, but with only one vehicle class and with uniform per-vehicle refunding throughout the entire class. This type of standard would create a large competitiveness imbalance between large and small vehicles, inducing substantial revenue flows from large to small vehicles and significantly limiting consumer choice. The same would be true of a single-class feebate, and AB 493 mitigates these effects by employing a zero band and feebate caps. These mechanisms could also be replicated with a tradable standard. The zero band would be implemented by considering the emission

level of vehicles within the band to match the mandated standard (irrespective of their actual emissions), for the purpose of compliance determination. A fee cap of $2500 (for example) would be replicated with the standard as follows: If a vehicle's emission level exceeds an upper threshold, which is higher than the standard by $2500 divided by the current market trading price, then its emission level would be considered to be at the threshold for the purpose of compliance determination. Emissions in excess of the threshold would be unregulated, ensuring that no vehicle requires purchased emission allowances in excess of $2500. Similarly, a $2500 rebate cap would be replicated by applying a lower threshold below which additional emission reductions would not be credited, ensuring that no vehicle receives more than $2500 from allowance sales.

The policy alternatives outlined above have deficiencies that could be remedied by using a more efficient allocation method[2], but the main point of the above comparisons is just to illustrate the parallelism that exists between tradable standards and feebates (irrespective of whether they are efficiently designed). This parallelism can help elucidate policy aspects of feebates by considering how the corresponding standard-based instrument would operate.

For example, if the AB 1493 regulations were implemented with a single vehicle class (no PC/LDT1-LDT2 distinction), ARB's methodology would have resulted in a uniform standard of 281 gm/mi, and average emissions (based on a MY 2002 market profile) would be 15 gm/mi greater than what would be allowed under AB 1493. The regulations were required to be feasible and cost-effective for the "least-capable" manufacturer, General Motors, which is more specialized in large vehicles; so a one-class standard would have been excessively lenient for small vehicles. Due to the 15 gm/mi excess, this type of standard would fail AB 1493's maximum feasibility criterion. By the same rationale, the corresponding single-class feebate with uniform refunding would fail maximum feasibility because the mandated feebate price would have to be excessively lenient to accommodate the least-capable manufacturer.

One question pertaining to feebates is how manufacturers might adjust prices in response to the feebate. Would they raise prices on low-emission vehicles, taking rebate gains away from consumers? And would they lower prices on high-emission vehicles, absorbing the costs internally and nullifying the consumer's disincentive to purchase high-emission vehicles? Considering the complementary tradable standard, the market would be expected to allocate feebates between consumers and manufacturers in the same way that it would allocate trading gains and losses. In either case, if manufacturers absorb the gains and losses internally the feebate or trading incentive would shift from consumers to manufacturers. (This is not problematic – Economic studies indicate that almost all of the market response to feebates would come from manufacturers' adoption of technology rather than altered consumer choices, and the AB 1493 regulations assume that compliance will be achieved primarily by adopting technology.)

Another question that has come up with respect to AB 32 is whether the statute authorizes ARB to adopt a feebate policy. It should be recognized that a feebate is

[2] One such method is discussed in "Vehicle Feebates and AB 493," http://ssrn.com/abstract=969444.

substantially equivalent to a tradable standard in terms of its fiscal effects. (This was not recognized in the AB 1493 legislation.) In either case, the policy is revenue-neutral within the regulated sector, and feebate revenue transfers have essentially the same effect as trading transactions. (A similar policy correspondence exists between cap and trade with free allocation and refunded taxes, or between auctioned emission allocation and unrefunded or partially refunded taxes.)

The essential difference between feebates and tradable standards is that under a feebate policy, emission prices are regulated and the market determines emission levels in response to the feebate incentive, whereas tradable standards regulate emission intensity and allow the market to determine prices. Feebates may be preferred from the perspective of cost-effectiveness because they would eliminate the price volatility and transaction costs that typify trading systems. However, from the standpoint of the AB 32 statutory requirement, the fundamental question is which approach would result in lower emissions. Since the relationship between emission price and aggregate emissions is the same for a tradable standard and its complementary feebate, an equivalent question is which approach would lead to a higher emission price. The higher-price alternative will result in lower emissions.

The AB 1493 regulations were required to be achievable with commercially available technologies whose costs would be fully offset by operating cost savings, assuming a fuel price of $1.74/gal. Fuel savings are accrued over a (typical) 16-year vehicle lifetime, and assuming a 5% real discount rate, the present value of the fuel savings is $1.18/gal. Based on a typical vehicle lifetime VMT of 200,000 miles and fuel emission intensity of 8900 gm CO2 per gallon; the $1.18/gal price corresponds to a technology cost limit of $26.49 per gm/mi. Estimated average compliance costs for AB 1493 are substantially lower – $10.93 and $13.27 per gm/mi for PC/LDT1 and LDT2, respectively[3]. Marginal costs for the most expensive compliance options would be higher than average costs, but no higher than the $26.49 per gm/mi limit.

Trading prices would tend to equilibrate to marginal technology costs, so trading prices under AB 1493 would be expected to remain below the $26.49 per gm/mi limit, and a fundamental question for feebates is whether an emission price at that level or significantly higher could be mandated. There are actually two separate questions that should be considered in evaluating feebate options: First, how would AB 1493 compare to its complementary feebate policy (i.e., using the same allocation methodology for refunding); and second, how would the complementary feebate compare to other feebate options (e.g. AB 493) that use different allocation methods? This analysis approach would make it possible to disaggregate and distinguish differences in policy performance that result from the allocation method from those resulting from generic differences between standards and feebates. It is important to maintain this distinction, because the viable emission limits (for standards) or emission price (for feebates) can depend critically on the allocation method.

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[3] from Tables 6.2-1 and 6.2-7 in the Aug. 2004 ISOR and Sept. 2004 Addendum,
http://www.arb.ca.gov/regact/grnhsgas/isor.pdf
http://www.arb.ca.gov/regact/grnhsgas/addendum.pdf

The emission price is one factor that affects policy performance, but price stability can be equally important. Quantity instruments such as emission standards rely on predictive assumptions that typically overestimate technology costs or are highly biased in favor of cost conservatism. As costs come down due to unanticipated technology innovation and economies of scale, trading prices correspondingly fall. But under a feebate system, the mandated price remains constant, so the regulatory policy can automatically accommodate changing market conditions and capture the environmental benefits of innovation and cost reductions without additional regulatory intervention. Quantity instruments can be made somewhat adaptable by using a system of declining emissions limitations such as the AB 1493 phase-in schedule; but whether the emission limits are fixed or time-variable, they must be sufficiently cost-conservative to ensure cost effectiveness and cost acceptability under worst-case predictive assumptions (e.g., the $1.74/gal benefit valuation for AB 1493). Feebate policies, which regulate emission prices directly, are not as constrained by predictive bias, and to the extent that they are affected by cost over-estimation, the effect would be to make the policy more stringent, not less, resulting in greater-than-anticipated emission reductions.

As noted above, all of these policy considerations relating to tradable standards versus feebates pertain equally well to cap and trade versus refunded taxes. In accordance with AB 32, Sec. 38561(c), ARB should consider the empirical experience of other states and nations in evaluating these regulatory alternatives. One of the Market Advisory Committee panelists at the Feb. 27 meeting, Martin Nesbit, gave a presentation on the EU trading program in which he offered the following counsel: “In California, don't expect that you are going to set up a market system and have a price for allowances which is then stable for years ahead. It's not going to work like that. There will be shocks, there will be new data; markets respond to that data. That's the point of a market system.”[4] The function of a feebate-type price instrument, by contrast, is to provide both long-term market incentives and a stable investment climate that can help facilitate a rapid and orderly transition to a low-carbon economy.

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[4] Webcast archive at 01:00:55.